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## Stress, anxiety and work: A longitudinal study

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Nervous strain at work amongst a sample of 1415 men, all 26 year old members of the National Survey of Health and Development, was found to relate both to their predisposition to anxiety and to their own report of day-to-day activities in their job. Level of work was the dominant factor in the analysis, men in high-level jobs being more likely to report nervous strain than men in manual work. Susceptibility to anxiety and specific work factors (supervising, teaching, contact with people, driving, skilled machine work) made approximately equal contributions to the rate of reported strain, after allowance for the level of work. Little evidence was found that stressful jobs were held by particularly anxious men and it was concluded that predisposing and precipitating factors made largely independent contributions to the report of nervous strain at work in this sample of workers.

People differ in their response to stressful features of work. Within a normally acceptable range of task demands or environmental conditions, some workers are found to have little resilience to mildly stressful or demanding events, while even in conditions of considerable threat or uncertainty there may be individuals who do not appear to experience stress. Early reports of this differential response to stressful circumstances came from doctors treating war breakdowns; it was found (Burton-Fanning, 1917; Slater, 1943) that the men who broke down under the stress of army life were those with a history of poor adjustment. These wartime studies are of particular interest in that compulsory enlistment ensured a population of subjects largely unselected for their ability to withstand stress. In civilian life, it may be expected that those predisposed to anxiety will be less likely than other men to take on, or hold down, a job demanding a high tolerance of stress.

The possibility that men in different types of work differ in their emotional resilience limits the conclusions to be drawn from cross-sectional studies of stress. Ferguson (1973), for example, found that telegraphists in Sydney had more time off work through neurotic illness (thought by their Union to result from stress intrinsic to the job) than telegraphists in Melbourne or Brisbane, but he also recorded that they were 'constitutionally less adequate' than telegraphists in the other cities. Doll & Jones (1951) had similar problems when interpreting their findings that foremen had a high incidence both of duodenal ulcers and of anxiety over work. It may be that the ulcers were caused by anxiety but the design of the study could not rule out the possibility that those craftsmen who were promoted to foreman were 'over-conscientious, hardworking, ambitious' men liable to develop ulcers whether or not they took on a supervisory role or felt anxious about their work. The difficulties of interpreting data on stress at work can be much reduced if a longitudinal approach

is adopted, the assessment of personality and emotional resilience being made before occupational stressors are encountered, symptoms of strain observed or a positive diagnosis made of conditions thought to be related to stress.

The first stage of such a longitudinal study is reported in this paper, using data from the National Survey of Health and Development (Douglas, 1976). In this study of young people followed up since their birth in 1946, personality and adjustment data have been collected since the early years on the labour market and information on 'stress related' conditions is being accumulated. Although the study was not designed to investigate stress (and the measures available are not ideal), the longitudinally collected data provide a rare opportunity to test the relative contributions of work factors and of a predisposition to anxiety in determining reported strain at work.

Discussion on stress can raise problems of terminology. In the present paper an attempt has been made to achieve some consistency in the use of the terms 'stressor', 'stress', 'strain'. 'Stressor' has been used to refer to identified external factors, potentially disturbing to the individual; 'stress' refers to the reported or inferred complex of 'stressors' and its impress on the person; 'strain' is used for the consequent feelings reported by the survey members.

#### METHOD

The men included in the analysis were all members of the National Survey of Health and Development, a study of men and women born throughout Great Britain between 3 and 9 March 1946 (Douglas, 1976). All children born in the survey week to middle class and agricultural parents were included in the follow-up sample, as was a sample of one in four children born in working class families. Twins and illegitimate children were not included in the longitudinal study.

Contact was made with the survey members (or, in the earlier years, their families) at least every 2 years from birth to 26 years. A further contact was launched in December 1977. In 1972/73 when the survey members were 26 years, a response rate of 87 per cent of those thought to be alive and in Britain was achieved. Amongst much other information collected at this time, were data on job and home stress, nervous troubles and detailed job content. The analysis reported in this paper was restricted to men who had completed a personality test at 16 years and who, at 26 years, were in full-time work (not in the armed forces) and were able both to answer detailed questions about their job and to provide information on stress and nervous troubles. This gave a sample of 1415 men, 78 per cent of those in full-time work.

Three categories of data are used in this paper. These are reports of strain at work, information on jobs and indicators of anxiety. To simplify presentation, a description of each set of data is included immediately before the discussion of findings specific to that area of study. First the incidence of reported strain is presented, with information on the nature of the stressors perceived by the survey members and the effects attributed to strain. This is followed by a discussion of data on employment and the identification of work stressors (precipitating factors) in this sample. An analysis is made of aspects of work statistically associated with reports of strain in the sample as a whole: factors of work identified as stressors in this way can be used to categorize jobs as being of high or low stress whether or not an individual worker reports that he is under strain. In the third section three indicators of anxiety (predetermining factors) are described and related, both individually and in combination, to reports

of strain at work. Finally, the paper examines whether the predetermining and precipitating factors operate independently in relation to reported nervous strain and whether there is any evidence of differential recruitment to stressful occupations.

### STRESS AT WORK

#### Data collected

The survey member was asked whether, in his work, he was under 'little or no nervous strain', 'some nervous strain' or 'severe nervous strain'. This simple question was relevant to survey members in all types of employment and has allowed comparisons of reported strain to be made across the range of jobs. Those with some or severe nervous strain were asked the main cause of the strain and how it affected them. This information (on nervous strain, perceived stressors and the effects attributed to strain) was collected near the beginning of the 1972 interview, before the details of the present job or of psychiatric adjustment.

#### Results

More than one in three of the sample of working men reported that they were under some or severe nervous strain at work. Of the sample interviewed, 39.6 per cent reported strain at work, a population estimate (obtained by re-weighting to allow for the stratified sample) of 38.3 per cent. Only 4.0 per cent of working men felt under severe strain and it was not in general practicable to distinguish in the results that follow between these men and those reporting only moderate strain.

The survey members' reports of the causes and effects of strain are shown as population estimates in Fig. 1. It will be seen that survey members answered the open-ended supplementary questions in terms of their individual response to perceived stressors in the working environment. All the men reporting that they felt under strain were able to identify a cause, but a sizeable group (11 per cent) reported

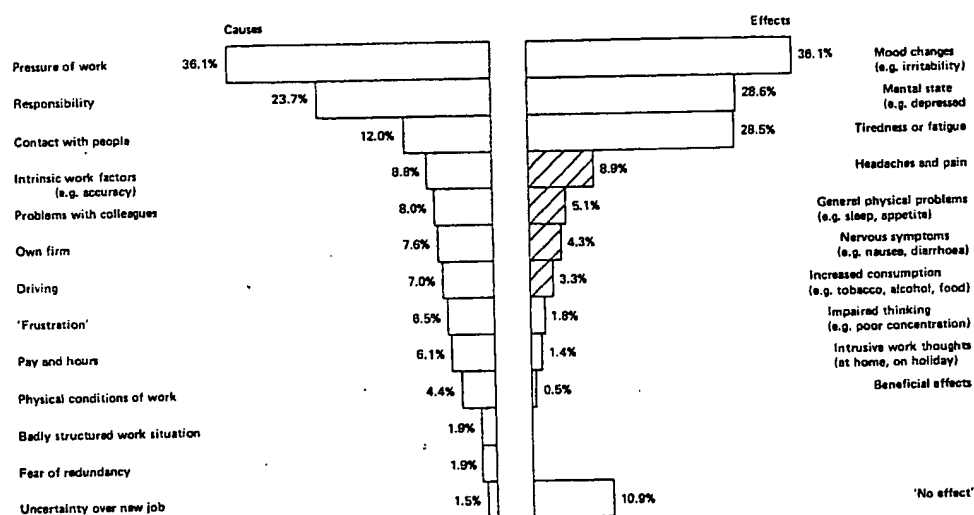


Fig. 1. Percentage of men under strain reporting each cause (perceived stressor) or effect of strain—multiple responses are included (population estimate).

no adverse effect; because of the possible longer term outcomes of stress, these men have nevertheless been included as 'under strain' in the analyses reported in this paper.

Figure 1 also shows, cross-hatched, the effects that could be regarded as troublesome physical habits or symptoms. Although it may be felt that these effects have been picked out somewhat arbitrarily, it is of interest that such symptoms were reported by only 16.6 per cent of those reporting moderate strain, the proportion rising to 49.1 per cent of those reporting severe nervous strain at work.

#### EMPLOYMENT

##### *Data collected*

Early in the occupational questionnaire the survey member named the job he was doing (job title) and later in the interview he was questioned in some detail about his day-to-day activities in the job. The aim was to establish (by asking about critical tasks) the highest level at which the worker was operating on eight dimensions of work. The survey member was given a rating (from 0 to 3) on each of these dimensions (Table 1), using criteria based on the 'people', 'data', 'things' scales outlined in the Dictionary of Occupational Titles (United States Department of Labor, 1966). The coders (members of the survey staff) also recorded whether or not the job involved driving or fast precision work. Further details of this coding scheme can be obtained from the author. Considerable efforts were made to ensure consistency in carrying out the rating task; some evidence for the validity of the method of self-reported job activity is included in the Discussion.

The job title was coded by clerks, employed to work on the Census, using Census codes (Office of Population Censuses and Surveys, 1970). The social class classification, amended to distinguish manual and non-manual semi-skilled workers, is used in this paper. The Census clerks did not have access to the detailed job descriptions in allocating the job title to a social class category, and the job title was only exceptionally used in allocating a survey member to a rank on the job elements in Table 1. Neither group of coders was aware of the psychiatric history of, or current work stress on, the survey member.

##### *Results*

Initial analysis of reported job strain revealed a strong correlation with level of work. Those in manual work were much less likely to admit to nervous strain than

Table 1. *Job elements rated to reflect detailed day-to-day functioning of the survey member*

Job element	Range of codes	Job element	Range of codes
1. Reading	0-3	6. Supervising (paid employees)	0-3
2. Writing	0-3	7. Teaching (classroom or on-the-job)	0-3
3. Calculating	0-3	8. Work with people (public or fellow experts)	0-3
4. Work with machines	0-3	9. Driving (on the public road)	0-1
5. Other manual work	0-3	10. Fast precision work (office machines as well as assembly, etc.)	0-1

those in high status jobs (Fig. 2). This relationship was shown to be a function of employment rather than reflecting, say, social class of origin. However, it was also found that a survey member's report of strain was related more to his level of day-to-day functioning (as shown by ratings on the ten job elements) than to the level implied by the title of his job. To allow for this, a scale was developed that reflected the level at which he was working on the job elements. The method of calculating the scale is given as an Appendix; it is important to recognize that the scale was computed without reference to the report of strain. Use of this level of functioning (LF) scale allows an unambiguous, if conservative, assessment of the additional effects on strain of each of the ten elements of work.

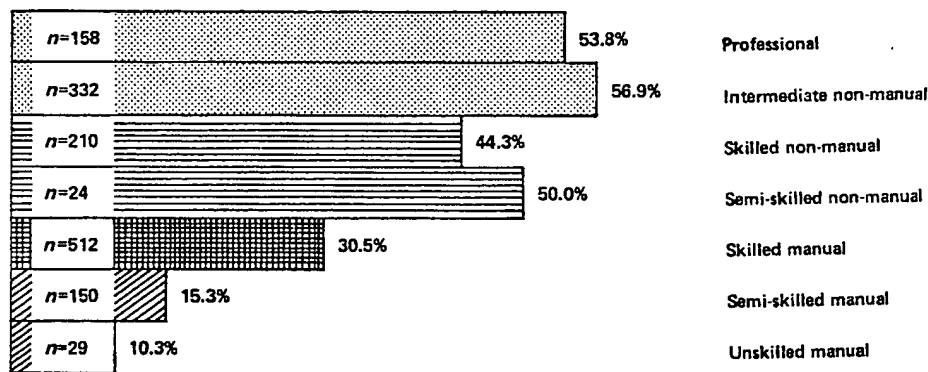


Fig. 2. Percentage reporting nervous strain at work by OPCS category assigned to job title.  
 Note: Adjacent groups similarly shaded did not have a significantly different report of strain.

#### *Work factors and reported strain at work*

Level of functioning (the LF scale) was correlated more strongly with reported strain ( $r=0.34$ ) than any of the ten work elements used in its computation. To test the additional explanatory power of the individual elements, a multiple regression analysis was carried out, with the report of strain as the variable to be explained and level of functioning as a covariate. It was found that five work elements contributed significantly ( $P < 0.05$ ) to this analysis. These were driving, supervising, teaching, work with people and work with machines. Initially these job elements (apart from driving) were entered as continuous variables, despite the limitations of the four point scale. Each element was then entered as a series of dummy variables and it appeared that each could be adequately represented by a single binary contrast. For teaching and work with people (and driving) the contrast was between those with any activity on the work element and those with none. For supervision the more useful contrast was between those with moderate or high levels of supervisory work (codes 2 and 3) and those with little or none (codes 0 and 1). Machine work was represented by contrasting those operating at a level requiring a high degree of skill and judgement (code 3) and all other workers (codes 0-2). Thus the relationship between reported strain and precipitating (work) factors is represented by an equation containing the LF scale as the dominant explanatory variable, and the five job elements making statistically significant, if minor, additional contributions.

## ANXIETY

*Data collected*

Three indicators of anxiety were used, reflecting the emotional resilience of the survey member. These were scores on a personality inventory, reported visits to a doctor because of nervous problems, and a report of current nervous strain at home. The three indicators were interrelated, but the correlations were low. The largest ( $r=0.14$ ) was between medical consultations for psychiatric problems and reported nervous strain at home.

Personality scores were obtained from the short form of the Maudsley Personality Inventory (Eysenck, 1958) completed when the survey members were 16 years. This inventory gives scores on two personality dimensions, extraversion and neuroticism, each scale having a range of scores from 0 to 12.

Information on nervous or psychiatric problems (involving the medical services) was collected at each of six contacts between 16 and 25 years. All in-patient admissions were checked with the hospital and reasons for the admissions confirmed. All other contacts with the medical services, including those mentioned for the first time at 26 years, were scrutinized by a psychiatrist working with the survey team, and those relating to psychiatric troubles, however mild, have been used as indicating nervous problems. The variable used in this paper contrasted survey members who had consulted a doctor about troubles of this sort at any time since 16 years with survey members who had had no such contact with the medical services.

At the 26 year contact the survey member was also asked if he was under nervous strain in his home and personal life. Any report of strain (either moderate or severe) is regarded as related to stress at home in this paper. Finally the reported cause of strain at home or psychiatric troubles was coded, and the onset of psychiatric problems established as accurately as possible.

*Results*

(a) *Personality.* Reported strain at work was related to neuroticism, measured at 16 years, but not to extraversion. Strain did not increase linearly with neuroticism and it was decided that use of the score as a continuous variable was not justified. A simple dichotomy into low (0-6) and high (7-12) scores has been used. Amongst low scorers 37.5 per cent reported strain at work, and high scorers 43.9 per cent ( $\chi^2=5.2$ ,  $P<0.05$ ).

(b) *Nervous and psychiatric problems.* One in seven of the men in the sample (217 of 1415) consulted a doctor about nervous troubles between 16 and 26 years. Those who had had troubles of this kind were more likely (55.3 per cent) to report strain at work than those who had not (36.8 per cent). Only 11 men under strain at work reported that their psychiatric problems were entirely caused by their present job or by worries about money. The date of onset of psychiatric problems could only be assigned to a fairly broad time period (of about 2 years) but it appears that at least 71 per cent (85 of 120 men with psychiatric problems and reported strain at work) had experienced these problems before starting their present job.

Two-thirds of the group of 217 men either reported their difficulties for the first time, or confirmed earlier information, during the 1972 interview. It seemed likely that these men would report more strain at work than those known from previous contacts to have had psychiatric problems, but who did not recall or report them at the 1972 interview. The data, however, provided no support for this. Those who failed to

report (at 26 years) previously recorded psychiatric troubles were just as likely to report job strain (54.4 per cent) as those who reported, or confirmed, psychiatric troubles during the course of this interview (55.8 per cent).

(c) *Stress at home.* Only 8 per cent of men (108 of 1415) reported that they were under some or severe nervous strain in their home or personal lives at the time of the 1972 questionnaire but those who did were substantially more likely (62.0 per cent) to report that they were under strain at work than those who did not (37.8 per cent). Although it is not possible to establish whether home stress is initiating or reflecting a more general anxiety, it may be of interest that while only two men (both working with their father) reported a 'home or personal' cause of job strain a substantial proportion (35/67) of men reporting strain both at home and at work gave work or money problems as the cause of the problems at home.

*Multifactor analyses including all three indicators of anxiety*

The data for the indicators of anxiety are shown in Table 2. It is apparent that all three factors make an independent and additive contribution to the report of nervous strain at work, although the marginal contribution of the 16 year old neuroticism score is small. The consistency of the results suggested that all three factors should be included in the assessment of the relative importance of emotional resilience and work stressors in determining the likelihood of reported strain at work. Before discussing the results obtained, it is of interest to mention the results of a further multifactor analysis that was carried out to investigate whether more severe symptoms (here the physical symptoms cross-hatched in Fig. 1) were reported by survey members with lower resilience to anxiety as defined by these measures.

This analysis of symptoms was restricted to the 561 men reporting nervous strain at work. A consistent and additive picture was again obtained, those with high neuroticism, with psychiatric problems or home stress tending to report more severe symptoms of strain at work. The trends were not, however, sufficiently marked to reach statistical significance ( $\chi^2$  home stress = 2.5,  $\chi^2$  neuroticism = 1.8), except for those with a record of psychiatric or nervous troubles ( $\chi^2 = 12.1$ ,  $P < 0.001$ ). This relationship between nervous trouble and reported symptoms of strain at work is not easily interpreted, as some of the visits to the doctor because of nervous trouble were

Table 2. *Proportions reporting nervous strain at work by indicators of anxiety*

	Nervous or psychiatric problems				Total	
	%	No.	%	No.	%	No.
No home stress						
Low neuroticism (0-6)	34.4	780	51.0	104	37.8	1307
High neuroticism (7-12)	37.9	346	54.5	77		
Home stress						
Low neuroticism (0-6)	51.2	41	66.7	18	62.0	108
High neuroticism (7-12)	67.7	31	72.2	18		
Total	36.8	1198	55.3	217	39.6	1415

An analysis of proportions (Dyke & Patterson, 1952) suggested that both psychiatric problems ( $\chi^2 = 19.0$ ,  $P < 0.001$ ) and home stress ( $\chi^2 = 17.5$ ,  $P < 0.001$ ) were significantly related to reported strain at work. The result of the  $\chi^2$  test for neuroticism was low ( $\chi^2 = 2.5$ ,  $P > 0.10$ ).

made specifically to consult about the symptoms being considered here. On balance, the data do suggest that 26 year olds with high susceptibility to anxiety report more severe symptoms of strain at work, but this will need to be confirmed (or refuted) in future studies of this group. Neither level of job, nor any of the additional work stressors, was found to relate at 26 years to the severity of the effects of strain reported by the sample of 561 men under nervous strain at work.

#### STRESS, ANXIETY AND WORK

It has been established in the preceding analyses that the report of nervous strain at work is related to the level of job, to a number of specific work factors, and to the indicators of anxiety introduced in the previous section as reflecting the worker's emotional resilience. In this section the aim is to establish how far these predisposing and precipitating factors act independently in establishing the likelihood of the survey member reporting he is under strain at work. Three ways of examining the data were adopted. First a composite equation, containing all nine variables, was calculated. The variance explained by each set of factors alone and in combination was examined (Table 3) and it appeared that the two sets of factors were making largely independent contributions to the explanation of reported strain at work. Second, terms for the interaction between predisposing and precipitating variables were fitted for each stressor in turn, and found not to be significant. This negative result was of some importance and was further explored, and confirmed, by examination of the data in tabular form. There was no suggestion that, for example, contact with people was stressful only to those with a low emotional resilience.

It appears from these analyses that predisposing and precipitating factors are making independent and additive contributions to the likelihood of the survey member reporting that he is under strain at work. The relative size of these contributions

Table 3. *Summary of the regression analyses relating nervous strain at work to level of work (LF scale), specific work elements and indicators of anxiety*

	F value (to remove from equation containing other specified variables)			
	LF scale only	With LF scale and other significant job elements	Indicators of anxiety (taken together)	Composite equation
Level of work (LF scale)	179.3	48.3	—	50.6
Driving	—	13.6	—	15.0
Supervising	—	13.2	—	14.9
Teaching	—	6.7	—	7.0
Work with people	—	4.9	—	3.6
Work with machines	—	4.7	—	4.0
Nervous or psychiatric problems	—	—	19.2	13.2
Concurrent home stress	—	—	17.8	27.1
Neuroticism at 16 years	—	—	2.5	3.7
Multiple R	0.34	0.38	0.18	0.42
% of variance	11.3	14.8	3.3	17.8

*Note:* All F values may be tested with 1-∞ degrees of freedom. Only the LF scale was entered as a continuous variable, all other factors being entered as the binary contrasts specified in the text. 1415 men were included in the sample for all these analyses.



can be assessed from Table 3. Nearly two-thirds of the variance explained by the composite equation is attributable to the level of functioning variable (the LF score), the specific job elements and indicators of anxiety accounting for approximately equal parts of the additional variance explained.

Finally, each of the work stressors was related, in a series of regression analyses, to the three indicators of anxiety. It has been suggested that supervisors might be chosen from those particularly susceptible to anxiety and a longitudinal study provided an opportunity to examine this. Only two significant results were found. Those involved, at 26 years, in on-the-job teaching (but not supervision) were found to be drawn from those with high neuroticism scores at 16 years ( $P < 0.01$ ). Second, those in higher level jobs had reported more nervous troubles (but not higher neuroticism or more strain at home) than those in lower level work ( $P < 0.01$ ). As a final check on the essential independence of the contributions made by the pre-determining and precipitating factors, the equation between reported nervous strain at work and job factors was recalculated for a sample consisting only of men with no psychiatric or nervous problems, reporting no strain at home and with a low neuroticism score. No change in the form of the equation was established, level of work remaining the predominant factor in determining the likelihood of reported strain at work.

#### DISCUSSION

The analysis reported in this paper has established that a number of features of work are stressful, when measured across the population as a whole, and that these work stressors are additive to, and independent of, the susceptibility of the worker to anxiety. The probability that an individual worker will report strain in a given job can be envisaged as being made up of two components, one systematic (representing the vulnerability of individual workers in particular jobs) and the other 'random' (the variation in reported strain not accounted for by the specific component). This unexplained variation may be interpreted as reflecting both the survey member's mood at the time of the interview and factors particular to his work place that are not adequately reflected in this study. As would be expected from this scheme many (but not all) of those with low resilience and highly stressful jobs admit to nervous strain as do some (but rather few) of those with high resilience and low stress jobs.

There are two outstanding problems of this analysis, one of method (the use of self-reported job content) and one of interpretation (the relation of level of work to perceived stress). Level of work is defined in this paper by job content and it is appropriate to consider first the problem of method. The ratings given to self-reported work activities have been shown, in the Appendix, to discriminate successfully between the categories of OPCS job classification, coded independently by census clerks. The success of this discrimination is of some importance in validating the self-report method of gauging job content: it suggests that the reports given by the survey members have some objective reality. The self-report approach in a study of stress is nevertheless open to the criticism that those currently under stress may tend to exaggerate the demands made on them by their job. If this were so, those reporting strain would also be expected to report, in each OPCS job category, a higher level of functioning. This difference in scores on the LF scale is indeed found (overall  $F = 61.5$ ,  $P < 0.001$ ) but further analysis suggests that it does not wholly arise from biased reporting. Those reporting strain within each job category were also found to be

earning significantly more (overall  $F=19.9$ ,  $P<0.001$ ); this result gives support to the interpretation that those reporting strain are indeed functioning at a higher level within job category and that the correlation between strain and job content does not simply reflect a style of self-report.

Interpretation of the relationship between level of work and perceived stress makes further use of the discriminant analysis. Job titles in themselves are of little use in determining the psychological mechanism between level and stress, but the weighting of variables used in constructing the level of functioning scale (final column of Table A1 in the Appendix) gives some indication of the job elements most powerful in distinguishing between low and high level jobs. Although computation of this scale gives a high weighting to work with people, indicated by other studies (for example, French & Caplan, 1970) to be an element associated with strain, it gives very low weights to other variables, such as supervision, which might have helped to explain the scale's high correlation with perceived stress. The intellectual skills, seen in Table A1 to be the most important group of elements in discriminating between levels of job, are those least frequently discussed as a source of stress.

The reports of the survey members (Fig. 1) suggest that intellectual demands as such are rarely seen as a cause of nervous strain, and it is likely that the coding of these job elements is reflecting some other feature of high-level jobs that is interpretable as a source of psychological stress. Examination of the coding scheme used suggests that the increasing skill levels on these intellectual job elements (and on people contact) reflect increasing autonomy and identifiable personal responsibility. Those survey members writing original reports, interpreting specialist documents, costing complicated systems or negotiating sensitive contracts would all, for example, have been coded as using a high level of specific skill, but each task is also characterized by distinct and personal long-term responsibility. In middle range jobs differences in responsibility can again be observed to be implicit in the different levels of functioning on intellectual skill elements. The shift foreman who produces a written report of incidents during his shift is taking a higher level of personal responsibility (and hence, it may be argued, inviting more strain) than a foreman who simply reports verbally to the incoming shift. Thus one possible explanation of the psychological demands made by high-level jobs is that they are characterized by job tasks involving identifiable personal responsibility which lead, through fear of failure, sense of urgency, or some other psychological mechanism, to reported strain.

The introduction to this paper emphasized the importance of longitudinal studies in establishing whether workers of different emotional resilience are recruited to jobs with different task demands. If workers were shown to bring to their job appreciably different levels of susceptibility to anxiety, this would imply that comparisons of reported strain between groups of workers were only meaningful if allowance were made for differences in emotional resilience. The study has not, however, provided convincing support for this proposition. Although workers' experience of stress has been shown to differ with their susceptibility to anxiety, there was only slight evidence of differential recruitment across the cohort as a whole.

It cannot be emphasized too strongly that this negative result should not be applied without justification to the interpretation of other studies. The National Survey data did not reflect employment policies of individual firms, but if employers do differ in the value they put on attracting well-adjusted workers (either throughout the organization or in particular grades) this may result in biased comparisons in

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studies within these organizations. It should also be recognized that the age of the sample in the present study will have minimized effects likely to be found in studies including older workers. With increasing age there will be a greater tendency for low-skilled jobs to be filled by those who have found themselves unable to cope, through psychiatric difficulties, with more responsible work. Although evidence of differential recruitment has not been found at 26 years, it merits further investigation in future studies of this group. The longitudinal approach will provide an opportunity to test whether in later years downward mobility or conditions of work explain the poor mental health reported by Kornhauser (1965) and others from cross-sectional studies of low-skilled workers.

This first report on stress at work in a cohort to be followed up into middle age has concentrated on questions of methodological importance to studies of stress. It has been shown that men predisposed to anxiety are more likely to report strain and that this effect is independent of work factors. Further, in course of the analysis, it has been found that men doing jobs within the same social class category differ in their level of day-to-day functioning in a way that is systematically related to reported strain. These findings underline the importance for studies of stress of the individual differences that exist between workers, in the way they do their job and their ability to cope with its stressful features. The results may serve as a reminder that unless studies make allowance for pre-existing or extraneous differences between groups of workers they are likely to make only a blurred or ambiguous contribution to the understanding of stress at work.

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## APPENDIX

*Development of the LF scale*

Preliminary analyses of the relationship between reported strain, OPCS category of job title and a number of additional variables indicated that use of the job title category as an indication of level of work would lead to spurious or ambiguous conclusions. To overcome this a scale was developed that reflected the underlying dimension implicit in the OPCS categorization but was independent, for each individual, of his own job title category. The scale was computed as the first discriminant function of an analysis in which the categories to be discriminated were the seven job status categories of Fig. 2, and the discriminating variables were the ten job elements (entered as 'continuous' variables). All the job elements except supervision added significantly to the discrimination between job status categories (Table A1) and the first discriminant function was readily interpreted as level (or status) of work. Standardized to a mean of zero and variance of 1, it ranged with steadily decreasing mean scores from a mean of +1.21 for professional workers to -1.31 for those in unskilled manual work. Scores on this discriminant function are referred to as LF (level of functioning) scores throughout this paper.

Table A1. *Summary of the stepwise analysis discriminating between the seven levels assigned to job titles*

Job elements (in order of inclusion in stepwise analysis)	F (to remove element from analysis containing all job elements)	Probability	Standardized coefficients—first function only
Writing	33.6	$P < 0.001$	+0.77
Reading	20.3	$P < 0.001$	+0.40
Work with machines	15.6	$P < 0.001$	-0.26
Work with people	18.4	$P < 0.001$	+0.38
Work with hands	12.4	$P < 0.001$	-0.11
Driving	10.4	$P < 0.01$	-0.12
Calculating	6.0	$P < 0.05$	+0.26
Teaching	5.2	$P < 0.05$	+0.02
Fast precision work	6.3	$P < 0.05$	+0.09
Supervising	2.2	$P > 0.10$	+0.04

The first discriminant function accounted for 86 per cent of the standardized between-group variance. The second function, accounting for 9 per cent of the variance, was unrelated to strain at work.

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